Project title:	Control of pear sucker
Project number:	TF 60 [Previously APRC SP 60]
Report:	Year 2 annual report 1994
Project leader:	Jerry Cross, HRI East Malling
Key words:	pear, pear sucker, *cacopsylla pyricola*, Conference

This project report was originally issued by the Apple & Pear Research Council, under project number SP 60.

Whist reports issued under the auspices of the HDC are prepared from the best available information, neither the authors nor the HDC can accept any responsibility for inaccuracy or liability for loss, damage or injury from the application of any concept or procedure discussed.

The contents of this publication are strictly private to HDC members. No part of this publication may be copied or reproduced in any form or by any means without prior written permission of the Horticultural Development Council.

© 2003 Horticultural Development Council

HORTICULTURE RESEARCH INTERNATIONAL

Report to:	Apple and Pear Research Council Stable Block Bradbourne House East Malling West Malling Kent ME19 6DZ
HRI Contract Manager	Mr Jerry Cross Entomology Department Horticulture Research International East Malling West Malling Kent ME19 6BJ
Period of investigation:	May to July 1994
Date of issue of report:	19 January 1995

CONTRACT REPORT

Control of Pear Sucker 1994

Undertaken for APRC

PRINCIPAL SCIENTIST AND AUTHOR OF REPORT

J.V. Cross, MA MRPPA FRES Entomologist

Authentication

I declare that this work was done under my supervision according to the procedures described herein and this report represents a true and accurate record of the results obtained.

Signature .....

J.V. Cross

Date ...9.Feb.95.....

CONTENTS

CONTROL OF PEAR SUCKER 1994

SUMMARY

Two replicated orchard experiments in Kent in 1994 investigated the efficacy of foliar sprays of pesticides against pear sucker, *Cacopsylla pyricola*, on pear. A further experiment failed because pest populations declined to unacceptably low levels. In one experiment, the fungicide Karamate (2 sprays of 4.5 kg product ha^{-1} at a 14 day interval) greatly reduced numbers of nymphs, though no effect was observed in the other experiment. Insegar (600 g product ha^{-1}) also showed promise, though was slow acting.

Apart from the Mitac standard, the other products tested, including single sprays of AC801757, a 'coded' treatment, Dimilin, Nemolt and Consult were either ineffective or insufficiently effective for commercial purposes, at least in the short term (up to 21 days after treatment). Post-blossom admixture of sulphur (4.2l ha^{-1} 800g l^{-1} SC) to a 14 day programme of captan (4.5kg 80% WG ha^{-1}) sprays for scab control did not significantly reduce pear sucker egg or nymph populations compared to a captan only programme. After the first assessment 4 days after the third spray in mid-June, populations subsequently declined due to unfavourable weather.

Further work to investigate Karamate, admixture of sulphur with scab fungicides, to validate results and test new products is recommended for 1995.

INTRODUCTION

New effective chemical control methods for pear sucker are needed urgently. Work funded by APRC to screen new promising materials was started in 1993 (Cross, 1993). Some promising insecticides were identified, including AC801757, Nemolt and Insegar. Poor results were obtained with Consult, which according to DowElanco, the manufacturer, was used at too low a dose rate in the 1993 experiments. Further developments are the widespread practices of admixture of sulphur to scab fungicide sprays on pears, and the use of the fungicide mancozeb to suppress pear sucker. These practices are not based on scientific experimentation and their validity is open to question.

Further replicated orchard experiments done in 1994 to investigate these matters and confirm previous results are reported here.

MATERIALS AND METHODS

The two experiments were done in commercial pear orchards (cv Conference with Doyenne du Comice pollinators) at Mockbeggar Farm (experiment A) and Elverton Farm (experiment B), Teynham, Kent. The orchards had a history of serious infestation by pear sucker. At Mockbeggar Farm the orchard was planted in 1987 as a zig-zag 2-row bed (4.2 x 1.5 x 0.8m), at Elverton Farm the orchard was at least 30 years old and planted as single rows 3.65 x 3 m.

Experiment A

Treatments consisted of one spray of a range of 7 insecticides or two sprays of the fungicide Karamate in comparison with water only and untreated controls (tables 1 and 2). The experimental design was a randomised complete block with four replicates. Plots consisted of 5 adjacent trees including a guard at each end, and also had a guard row either side. Sprays were applied at a volume rate of 500 l ha^{-1} on 27 June 1994 (temperature = 23°C). Application was with a Solo 436 self-propelled mini, air-assisted tree and bush fruit sprayer especially adapted for small plot experimental work. The sprayer (forward speed 3.0 kmh^{-1}) was fitted with Albuz 220 (red) nozzles at a pressure of 4.5 bar and carefully calibrated before treatment application. Applied volume rates were within 6% of those required, except for treatment 2 (Mitac) which was 15% under-applied due to partial blockage of a nozzle at the time of application.

In order to prevent the build up of Anthocorid predators, the whole trial area, including guards, was oversprayed with Dursban 4 ($480gl^{-1}$ chlorpyrifos EC) at a rate of 2.0 l product in 500 l water per hectare on 11 July 1994.

A sample of 50 young expanded leaves was taken from extension shoots from each plot on 30 June, 7 July and 18 July 1994. The numbers of pear sucker eggs and of each life stage of nymphs were counted in the laboratory by examination under a binocular microscope. Analysis of variance was done on the data. As the numbers of nymphs of the latter stages were low and scanty, the total number of nymphs per sample was calculated. Square root transformation of the total nymph counts was done to improve the analysis.

Experiment B

At Elverton Farm a much larger experiment (c 5ha) compared 14-day programmes of sprays of the fungicides captan (4.5 kg 80% WG ha^{-1}), captan + sulphur (4.21 $800gl^{-1}$ SC ha^{-1}) and Karamate (4.5 kg 75% WG ha^{-1}) (table 2) starting from the early fruitlet stage and applied with commercial application equipment. The experiment design was a randomised complete block with eight replicates. Plots consisted of five rows each of 20 trees, but only the central 14 trees in the centre row were assessed. Sprays were applied with a Commandair axial fan sprayer (2nd model, enhanced) at a volume of 150 l ha^{-1} on 12 May, 26 May, 9 June and 21 June. Random samples of 25 young expanded leaves from shoots and 25 rosette leaves were taken from each plot on 13 June 1994. The numbers of eggs and of each life stage of nymphs were counted in the laboratory as in Experiment A.

RESULTS

Experiment A

There were no statistically significant differences in the number of pear sucker eggs on 30 June 1994, 3 days after treatment (table 3). However, for numbers of nymphs, although an F test for treatment differences did not reach the $P \leq 0.05$ level, the greatest

mean numbers of nymphs occurred on the untreated plots, and the least on those of the standard, known effective treatment, Mitac (treatment 2). The Karamate treatment had the second lowest treatment mean.

By 7 July, 10 days after treatment, there were statistically significant treatment effects on the number of eggs ($P \leq 0.02$) and nymphs ($P = 0.008$ for transformed values). However, none of the treatments had significantly fewer eggs than the control, though the Consult appeared to have more. Four of the treatments had significantly fewer nymphs than the water or untreated controls. In ascending order of magnitude of mean, these were Karamate, Mitac 20, AC801757 and Insegar.

By 18 July, 21 days after treatment (7 days after the second Karamate application), there were no statistically significant differences in egg numbers which had generally declined. Only the Karamate had significantly less nymphs than both the water only and untreated controls. The difference between the means for the Insegar and the control did not quite reach statistical significance.

Experiment B

There were no statistically significant treatment effects (table 4). Sampling was discontinued after 13 June because populations of pear sucker declined to unacceptably low levels.

DISCUSSION

The decline in pear sucker numbers in pear orchards throughout SE England from July onwards meant that experiment A could not be repeated successfully at a second site in 1994. This decline was due mainly to adverse wet, cool weather conditions, but also to predation by Anthocorids.

The results of the experiments reported here conflicted in some respects with experiments done in 1993 (Cross, 1993) and in some cases with other previous work.

The acaricidal and insecticidal properties of the dithiocarbamate fungicides have been long known but often little exploited. McMullen and Jong (197), Bode (1978) and Burts (1983, 1984) reported that foliage sprays of mancozeb at high doses (up to 11 kg ha^{-1} per spray) showed promise as a selective pesticide in management of pear sucker (*Cacopsylla pyricola*), suppressing populations of eggs and nymphs considerably. This research finding has not been exploited in the UK but has now been brought to attention of growers by M. Hutchinson, Wisbeach who recommended that Karamate should form the basis of scab control during the critical part of the season for pear sucker on pear. Clearly the results of the two experiments reported here are contradictory as to their effects on pear sucker, a strong efficacious effect from Karamate being observed in one experiment, but no effect in the other.

No benefit was apparent from admixture of sulphur with Captan, though the decline in pear sucker numbers prevented assessments over a sufficiently long period of time. Addition of sulphur from bud-burst is now widely practised in UK pear orchards, but there is no experimental basis for the belief that sulphur has an effect on pear sucker. It may be that sulphur hardens the foliage, thereby making the trees less suitable as hosts for pear sucker (Burts, 1984). In the experiment reported here, sulphur was only added from petal fall onwards. Admixture from bud-burst onwards, as is practised commercially, requires investigation.

The poor performance of AC801757 in experiment A is disappointing, and contradictory to the effect obtained in two APRC-funded experiments in 1993 (Cross, 1993). Consult also performed poorly, both in 1993 experiments where the dose used (400 ml product ha^{-1}) was considered too low, and also in experiment A reported here where the dose was increased by a factor of 3.75 (to 1.5 l product ha^{-1}). The 'coded' treatment also performed poorly.

As in the 1993 experiments, Dimilin performed poorly, no significant reduction in numbers of nymphs being apparent even 21 days after treatment compared to the water only control. Similarly, the related material Nemolt showed little effect. In the 1993 experiments (Cross, 1993), and in experiments by Solomon and Fitzgerald (1988), Nemolt was effective though slow acting.

Experiment A showed Insegar to be partially effective though slow acting, confirming previous work (Cross, 1993; Solomon and Fitzgerald, 1987, 1990; Staubli, 1986). Registration of this product for use against summer fruit tortrix moth on pear will have benefit for pear sucker control.

CONCLUSIONS

Insegar, though slow acting, is at least partially effective for pear sucker control and registration for use on pears (for summer fruit tortrix moth control) will be beneficial.

Previous research from America and the results of one of the experiments reported here suggests that mancozeb may suppress pear sucker. However, use of mancozeb requires further investigation before any firm conclusions are drawn.

Previous work has shown that Dimilin or Nemolt have a suppressant effect, but are slow acting.

Consult shows little promise.

Conflicting results with AC801757 require further investigation.

RECOMMENDATIONS FOR FURTHER WORK

Further work to investigate the use of mancozeb and admixture of sulphur with scab fungicides is recommended for 1995.

Further small plot experiments to validate previous results and to investigate new promising compounds is recommended for 1995.

ACKNOWLEDGEMENTS

I am most grateful to Mr. Robert Oliver and Mr. Tony Redsell for providing the experimental orchards and for application of the sprays in experiment B. Also to Miss Suzzanne Neave and Mr. Graham Jones for assistance with the practical work. Finally, to DowElanco, Ciba-Agriculture and Cyanamid for their support.

REFERENCES

BODE, W.M. (1978). Performance of selected insecticides against pear psylla. *Psylla pyricola* (Homptera: Psyllidae). *Journal of the New York Entomological Society*, **Vol 86** (1978, pub 1979), p279.

BURTS, E.C. (1983). Effectiveness of a soft-pesticide programme on pear pests. *Journal of Economic Entomology*, **Vol 76, 4**, 936-941.

BURTS, E.C. (1984). Soft pesticides and hard trees. Bulletin IOBC/WPRS, 7(5), **Vol 7, No. 5**, 325- 329.

CROSS, J.V. (1993). Control of pear sucker 1993. Report to APRC of 10 November 1993, 12pp.

McMULLEN, R.D. and JONG, C. (1970). Pear psylla control experiments. *Journal of Economic Entomology* **64**, 1266-1270.

SOLOMON, M.G. and FITZGERALD, J.D. (1987). Fenoxycarb for control of pear sucker, *Cacopsylla pyricola*. Tests of Agrochemicals and Cultivars 8 (Annals of Applied Biology **110**, supplement) 22-23.

SOLOMON, M.G. and FITZGERALD, J.D. (1988). Teflubenzuron for control of pear sucker *Cacopsylla pyricola*. Tests of Agrochemicals and Cultivars (Supplement to the *Annals of Applied Biology* **112**), 16-17.

SOLOMON, M.G. and FITZGERALD, J.D. (1990). Fenoxycarb a selective insecticide for inclusion in integrated pest management systems for pear in the UK. *Journal of Horticultural Science* **65(5)**, 535-539.

TABLE 1

Treatments applied in experiment A

Treatment	Product	Product dose ha^{-1}	Product concentration	No. of sprays
1	Dimilin WP	600g	$1.2gl^{-1}$	1
2	Mitac	3.5l	7.0ml l^{-1}	1
3	AC801757	800g	1.0g l^{-1}	1
4	'Coded'	-	-	-
5	Nemolt	1.5l	3.0ml l^{-1}	1
6	Insegar 25wp	600g	1.2g l^{-1}	1
7	Consult	1.5l	3ml l^{-1}	1
8	Karamate Dry Flo	4.5kg	9g l^{-1}	2
9	Water only	-	-	1
10	untreated control	-	-	-

TABLE 2

Products

Product	**Manufacturer/ supplier**	**Active ingredient**	**Formulation**	Approval status 1994
AC801757	Cyanamid	fenpyrad	20% WG	not approved
Captan 80 WG	Zeneca	captan	80% w/w WG	approved *
Consult	Dow-Elanco	hexaflumuron	100 g/l SC	not approved
Dimilin WP	Zeneca	diflubenzuron	25% w/w WP	approved
Karamate Dry Flo	Rohm & Haas	mancozeb	75% w/w WG	approved*
Mitac 20	Agrevo	amitraz	200 g/l EC	approved
MTM Sulphur Flowable	MTM Agrochem	sulphur	800 g/l SC	approved*
Nemolt	Cyanamid	teflubenzuron	150 g/l EC	not approved

* for use on pears, though not recommended for pear sucker control

TABLE 3

Mean numbers of pear sucker eggs and nymphs per 25 leaves 3, 10 and 21 days after application of treatments (d.a.t.) in experiment A

Treatment	No. of sprays	30 June 1994 (3 d.a.t.)			7 July 1994 (10 d.a.t.)			18 July 1994 (21 d.a.t.)		
		eggs	nymphs		eggs	nymphs		eggs	nymphs	
		x	x	√x	x	x	√x	x	x	√x
1 Dimilin WP	1	284	63.2	7.75	196	45.0	6.61	141	21.3	4.60
2 Mitac 20	1	296	24.3	4.89	165	23.5	4.77	144	38.2	5.71
3 AC801757	1	176	74.5	7.89	122	31.3	5.44	129	31.0	5.36
4 'coded'	-	267	67.7	8.17	109	39.2	6.24	145	23.8	4.76
5 Nemolt	1	353	95.0	9.44	160	40.0	6.01	186	25.3	4.90
6 Insegar 25wp	1	207	44.7	6.42	227	31.5	5.50	164	9.5	2.87
7 Consult	1	275	72.2	8.27	284	36.5	5.88	170	34.5	5.65
8 Karamate Dry Flo	2	214	28.0	5.05	188	17.8	4.14	106	7.7	2.64
9 Water	1	194	75.7	8.32	129	60.0	7.53	113	22.0	4.69
10 Untreated control	-	275	109.5	10.20	163	72.7	8.32	169	44.5	6.56
Fprob		0.83	-	0.10	0.02	-	0.008	0.61	-	0.009
s.e.d (27 df)		104	-	1.78	44	-	0.96	40	-	0.96

TABLE 4

Mean number of pear sucker eggs and nymphs per 25 levels on 13 June 1994 in experiment B, 4 days after application of the third post-blossom spray at 14 day intervals

	eggs				nymphs			
Treatment	young leaves		old leaves		young leaves		old leaves	
	x	$\sqrt{x}$	x	$\sqrt{x}$	x	$\sqrt{x}$	x	$\sqrt{x}$
11 captan	667	24.5	122	10.2	46	6.19	25	4.52
12 captan + sulphur	637	25.2	270	15.0	40	6.27	46	6.22
13 karamate	680	25.2	88	9.1	43	6.43	12	3.33
		0.98		0.17		0.98		0.09
s.e.d.(6df)		3.9		2.9		1.29		1.08